in optimized designs. The number of tubes (or columns of tubes) is dependent on the power supply voltage and the desired voltage to be applied to each tube It is to be understood that each column of 8 tubes (and associated vias) in this example could be further subdivided such that **8** separate series of 28 tubes each are formed. However, nonuniformity of electrode characteristics could cause localized ox reheating and subsequent burnout of one tube resulting in the loss of the series of **28** tubes. Arranging the tubes into columns as shown with multiple vias provides redundancy and normalization of the current flow.

In operation, the air or other gas from which oxygen is to be extracted flows across the tubes **12** and by reason of the principles of ionic conductivity discussed hereinabove, a gas having a higher pressure of oxygen is formed in the interiors of tubes **12** and is collected in manifold **24**. This supply of oxygen is communicated via port **26** to the component having the oxygen requirement.

It is to be understood that while circular or cylindrical tubes having exterior and interior surfaces are shown in the described embodiment other configurations for the "tubes" could be us and the term "tube" is used herein only for purposes of convenience of reference.

An alternative arrangement to each column of hollow tubes is a hollow "cantilever shelf" configuration which would provide approximately the same effective surface area. These fiat hollow sections with one end molded closed would be manifolded together as the tubes are to provide a common output port. Internal stiffening ribs could be added between the opposing flat walls to increase the ability to withstand internal pressure as required.

The principles of this invention are described hereinabove by describing a preferred embodiment constructed according to those principles. It will be understood that the described embodiment can be modified or changed in a number of ways without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. An ionically conductive ceramic element comprising:

a plurality of tubes each having interior and exterior surfaces, and each having a closed end and an open end;

a tube support member receiving open ends of said plurality of tubes;

a first electrically conductive coating covering said exterior surfaces of said plurality of tubes;

a second electrically conductive coating covering said interior surfaces of said plurality of tubes; and

said ionically conductive ceramic element having at least two columns and a first electrode covering an exterior surface of said first column and an interior surface of said second column of tubes and a second electrode covering an exterior surface of said second column of tubes and an interior surface of said first column of tubes;

said first electrode being connectable to a source of electrical potential at a first polarity and said second electrode being connectable to a source of electrical potential at a second polarity.

2. The ceramic element described in claim **1** wherein said plurality of tubes are formed into rows and columns on said tube support member wherein each tube is connected to said first electrode and said second electrode and first and second electrode portions of each of said tubes in a column are electrically connected in parallel and wherein each of the tubes forming a row are electrically connected in series.

3. The ceramic element described in claim **2** wherein said first and second electrodes are formed by

cuts in said first and second electrically conductive coatings between said columns of tubes, said cuts extending longitudinally of and between the columns of tubes so that the portions of said first and second electrodes on opposite sides of each said cut are electrically separated, vias extended through said first and second surfaces adjacent each of said tubes and

electrical connections extending through said vias connecting a first electrode portion of each said tube in a row to a second electrode portion of a tube in an adjacent column in the same row to form a series connection across each row of tubes.

4. The ceramic element described in claim **3** wherein said electrical connections are constituted by the material forming said first and second electrodes coating the surfaces of said ceramic electrolyte extending through said vias.

5. The ceramic element described in claim **1**, wherein each the plurality of tubes is spaced from adjacent tubes.

6. An oxygen generator, comprising:

a first ceramic element having a tube support member and an array of tube members extending from said tube support member and formed into columns and rows;

a second ceramic element adjacent said first ceramic element; and

a seal between said first ceramic element and said second ceramic element;

said first ceramic element having at least two columns and a first electrode covering an exterior surface of said first column and an interior surface of said second column of tubes and a second electrode covering an exterior surface of said second column of tubes and an interior surface of said first column of tubes;

said first electrode being connectable to a source of electrical potential at a first polarity and said second electrode being connectable to a source of electrical potential at a second polarity.

7. The oxygen generator of claim **6**, wherein said first ceramic element includes a first electrically conductive coating covering exterior surfaces of each of said plurality of tube members; and

wherein said first ceramic element includes a second electrically conductive coating covering interior surfaces of said plurality of tube members.

8. The oxygen generator of claim **6**, wherein said first ceramic element is integrally formed.

9. An electrochemical element, comprising:

a ceramic element having a tube support member and an array of tube members extending from said tube support member;

wherein said tube support member and said array of tube members are formed from ceramic.

10. The electrochemical element of claim **9**, wherein said ceramic element is an electrolyte.

11. The electrochemical element of claim **9**, wherein said ceramic element is integrally formed.

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